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$SimCCS^{2.0}$ infrastructure solution for the southeast United States

Tech Snapshot
Infrastructure

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SIMCCS2.0

Open-source software for designing CO2 capture, transport, and storage infrastructure

SUMMARY

SimCCS2.0 (https://SimCCS.com/) is an open-source software package for industry, researchers, and government to design carbon dioxide (CO2) capture, transport, and storage (CCS) infrastructure that optimally links CO2 sources (e.g., power plants) with CO2 sinks (e.g., saline aquifers, depleted oil fields) to reduce industry carbon footprints and increase energy production.

MARKET

In 2017, the U.S. released about 3 billion tons of CO2 from industry sources. Those emissions aren't simply a burden on the atmosphere - they are a lost opportunity. SimCCS2.0 is designed for industry, researchers, and government to understand and make CCS infrastructure decisions. The software has been used by energy companies (oil and gas, electric utilities, ethanol production), state and federal governments, and researchers from universities, national laboratories, and other institutions. SimCCS2.0 will likely play a key role in how industry in the U.S. can profit from carbon credits (up to $50/tCO2) under Section 45Q of the U.S. tax code.

BENEFITS

SimCCS2.0 is the only software that can optimize across the entire CCS value chain to design the most cost-effective infrastructure design. SimCCS2.0 simultaneously links CO2 capture and storage with a realistic pipeline network—while minimizing carbon footprints and maximizing revenues.

- Designs complex infrastructure to optimally link CO2 sources and storage sites.
- Identifies real-world routes for CO2 pipeline networks and trunk lines.
- Maximizes industry revenues from carbon tax credits and enhanced oil production while reducing carbon footprints.
- Runs on laptops, the web, and supercomputers.
- Enhances collaboration through customization and shareability.
- Provides a user-friendly workflow.

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WHY WE ARE BUILDING SIMCCS2.0

Most scenarios for a clean-energy future rely on CCS technology—taking CO2 emissions from their sources, such as power plants, then sequestering it underground, using it for enhanced oil recovery, or converting the carbon into a product such as smart concrete. Poor economics have stymied the adoption of CCS. To solve this, SimCCS2.0 optimizes all parts of the infrastructure parameters to enable design of massive-scale CCS networks. The user-friendly software enables relative fine scale resolution (30 meters to 1 km or more) to the question of where pipelines could be built.

WHAT'S BEHIND OUR TECHNOLOGY

SimCCS2.0 is the only tool that includes an end-to-end suite of tools for CCS infrastructure optimization, economically flexible modeling, uncertainty analysis, and pipeline geolocation for massive-scale networks. Only SimCCS2.0 calculates the true geolocation of candidate pipeline networks with trunk lines aggregating large volumes of CO2 for transport. Models can be seamlessly adjusted to consider scenarios for cap-and-trade, changes in tax credits and CO2 values, and dynamic evolution of CCS networks. SimCCS2.0 won two R&D 100 Awards in 2019; a main award for Software and Services and a Special Recognition Medal for Corporate Social Responsibility.

OUR COMPETITIVE ADVANTAGES

SimCCS2.0 flexibly accounts for topographic, social, and geometric costs to identify potential CCS pipeline networks. The software incorporates barriers (e.g. rivers and roads) and corridors (e.g. existing rights of way) to improve cost accuracy and more realistically predict routes than is usually possible using traditional approaches. SimCCS2.0 includes an open-source, multi-platform desktop version (https://github.com/SimCCS/SimCCS) and an online Science Gateway interface (https://SimCCS.org/) that solve CCS problems through a desktop optimal solver, a custom heuristic, or high-performance computing. The project is supported by Team SimCCS (https://SimCCS.com), a network of 25 researchers from 15 different institutions including national laboratories, universities, research institutions, and non-profit organizations.

OUR TECHNOLOGY STATUS

SimCCS2.0 was released under an open source license in 2019. The tool is being used by a variety of industry, government , and university and research projects.

PUBLICATIONS AND IP

LANL Copyright No. C17147 SImCCS 2.0, open source under BSD

https://*SimCCS*.com/

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